Singapore/U.S. Vehicle Electronics & Architecture Workshop Meeting

PM HBCT VHMS Program

Larry Marino, Deputy
PM HBCT-VHMS, CBM &
CLOE/GCSS-Army Systems

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Varsity Combat Team

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Agenda

Objective: Provide an overview of PM HBCT ‘s VHMS Program (Informational Brief):

- Vehicle Health Management System Definition
- User Requirements and System Engineering Artifacts
- VHMS System Software and Hardware Components
  - VHMS Key Products
- Condition Based Maintenance & Command Guidance
- Off-Platform Reporting to the GCSS-Army Enterprise
  - Tactical Logistics Systems
- Question/Answer Session

VHMS Definition

- **On-platform:**
  - Improved embedded diagnostics (self reporting platform)
  - Data collection and storage (faults, supply, configuration management, etc.)
  - User interface for:
    - Interactive PMCS & troubleshooting (IETMs)
    - System state, configuration & supply status management
    - Off-platform reporting & requisitioning

- **VHMS links to Army Logistics Enterprise networks for (Future Capability):**
  - Logistics reporting
  - Supply requisitioning
  - Fleet data storage & analysis
  - CBM:
    - Predictive (use-based) maintenance
    - Development & refinement of prognostic (condition-based) maintenance algorithms

VHMS: Building the Future
Incremental Capability Development

PM HBCT Modernization Programs

PM HBCT Legacy Platform Upgrades

Prognostics:
Predictive Maintenance

CBM:
Fact Based, Trend Analysis

VHMS:
ED, Self Reporting, Self Monitoring

Platform Information:
Digital PM HBCT, IETMS, BIT/FIT, VDMS

Digital Platforms:
Digital Bus, Sidecar, Vehicle Databus (1553)

SENSE
Know more faster!

Data

Information

DECIDE
Make smarter decisions

Action

RESPOND
Improve process effectiveness

Outcome

VHMS Operational Requirement Traceability

Start with User Requirements from the Warfighter

Operational requirements with trace to approved ORDs

- Current diagnostic performance
- Record diagnostic events and data in non-volatile memory
- Report equipment health to operator
- Track on-hand fuel/ammunition and report to C2
- Report deadlining faults to C2
- Manage software and hardware configuration
- Incorporate class III ETMs
- Provide automated troubleshooting with ETMs
- Provide wired interface for SoS sharing

28 VHMS operational requirements

Operational requirements that need approval of draft ORD/CDD requirements

- Enhanced diagnostic performance
- Provide prognostic capability
- Track equipment capability and report to C2
- Incorporate class V IETMs
- Provide PMA
- Provide automated PMCS
- Track equipment usage
- Display vehicle history
- Provide wireless interface for SoS sharing
- Provide fault resolution and maintenance action tracking

33 VHMS operational requirements

Hard or Desired Requirement

Increment 1 Capabilities

Increment 2 Capabilities

Common System Engineering Document Tree

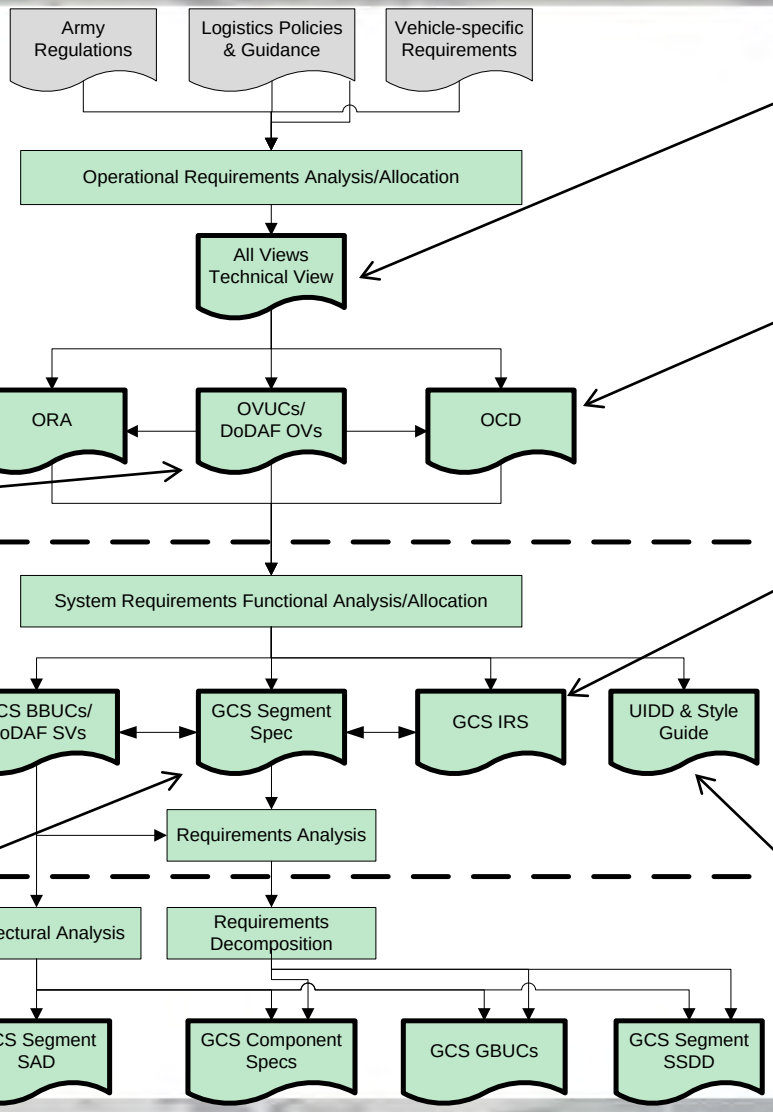
Derive Requirements to Performance Specifications

Operational Requirements Analysis provides top-level VHMS requirements & traceability to sources.

Operational Views & OV Use Cases describe VHMS capabilities through user scenarios.

System Views & Black Box Use Cases decompose VHMS capabilities into system functions and define interfaces.

GCS Requirements needed to implement VHMS.



VHMS scope, purpose, definitions and technical standards.

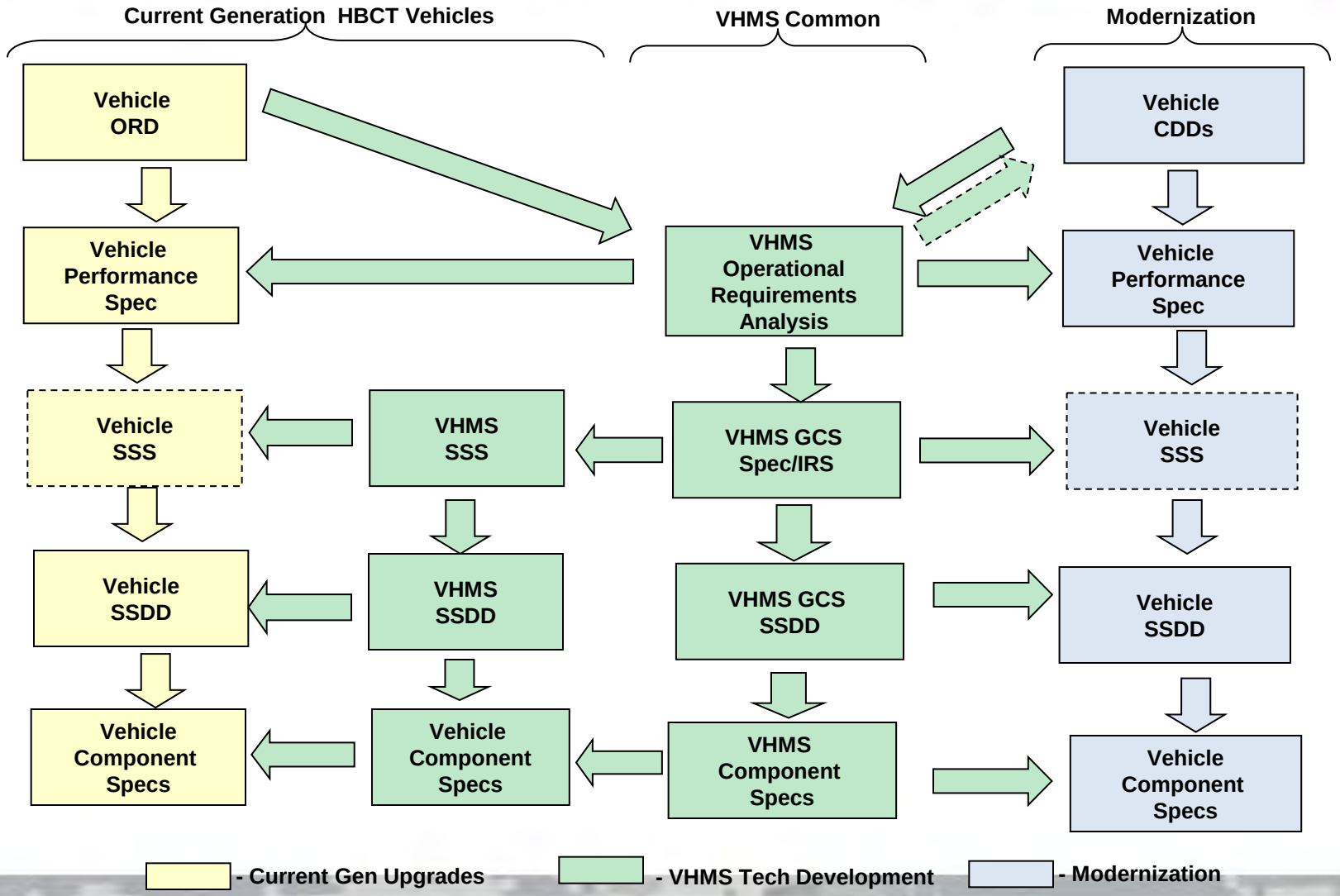
Operational concept describing the "as is" and "to be VHMS concept.

Interface requirements between on components on platform and requirements to communicate off-platform. (i.e.. GCSS-Army)

Common user interface design for each VHMS screen. Style guide to facilitate tailoring an individual screen.

VHMS Requirements Flow-Down

Requirements Across Platforms and Future Capability Increments



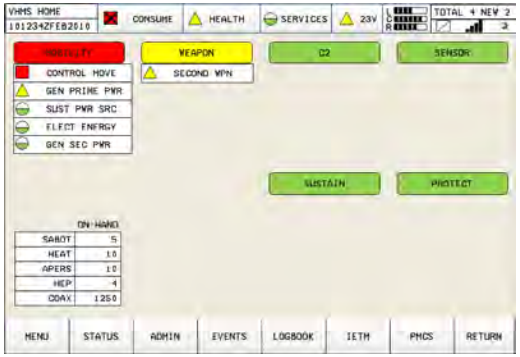
Vehicle Health Management System (VHMS)

- Development of overarching system requirements and architecture for a PM HBCT VHMS implementation
- Enhance and Integrate Diagnostics on platform
- Coordinate off-platform interfaces with Enterprise-level logistics systems (GCSS-A, CBM Data Warehouse)

BAE SYSTEMS

GENERAL DYNAMICS Land Systems

DRS TECHNOLOGIES

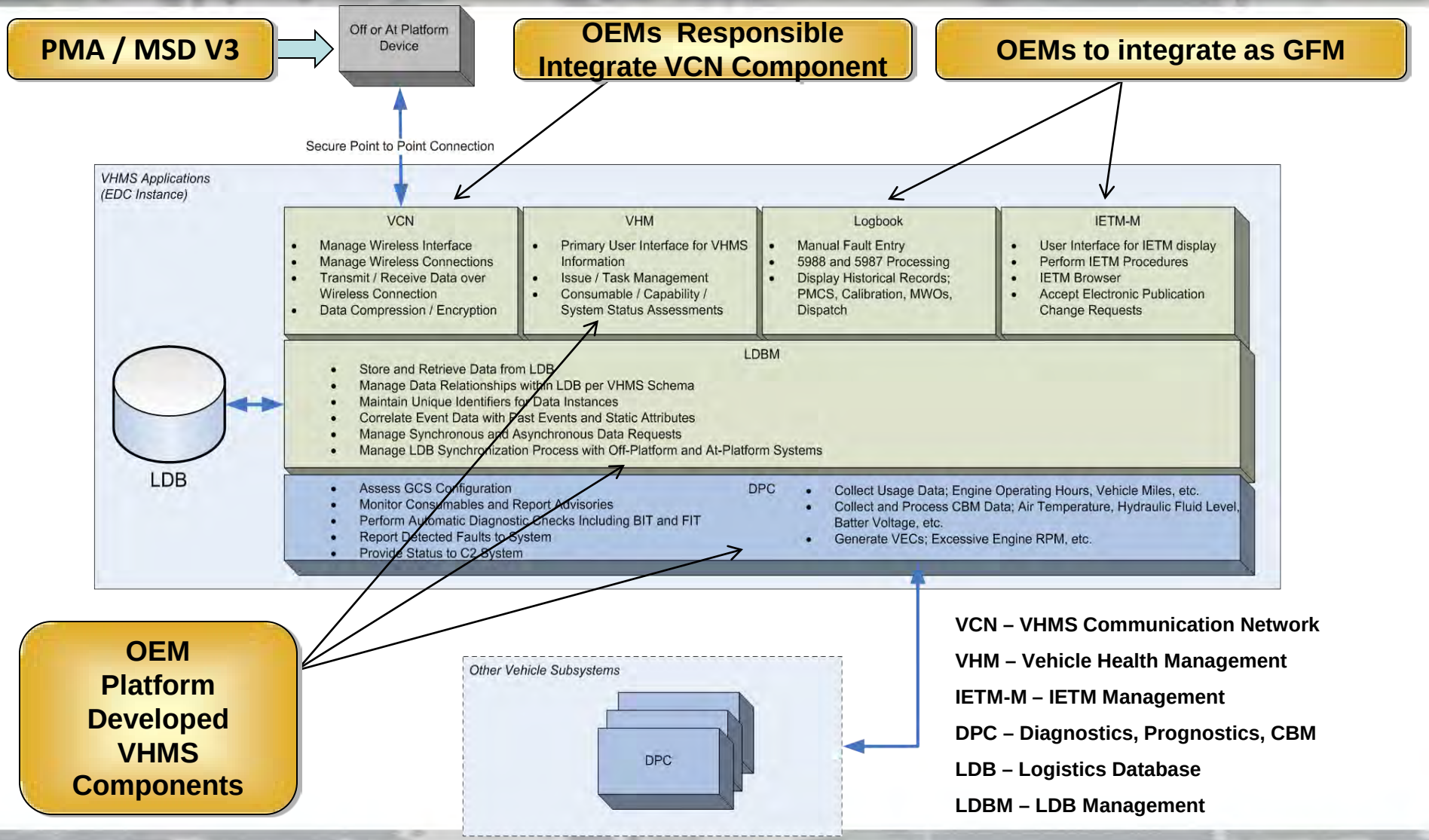


- Enhance Embedded Diagnostics
- Enable platform data storage and transfer
- Develop & integrate IETMs
- Integrate Ground Digital Log Book (GDLB)
- Plan for future upgrades (LRMs, SRU-level Fault Isolation)

- Centralized Health Management Application
- Common GUI that reduces training footprint for HBCT maintainers

Commonality where feasible with Industry Partners

GCS Software Architecture



Hardware Approaches

	PMA	EDC	Ethernet Switch	Wireless NIC
Abrams	 Portable Multi-Functional Display*	 Recording & Simulation Unit (RSU)	 E-Switch	 Common WNIC
Bradley & PIM	**Display/EDC**  SMART Display*		 E-Switch	 Common WNIC
Maintainer	 MSD V3			

MSD V3 to be used for At-Platform Functions & Off-Platform Data Transfer

*** Current display HW are surrogates until common display IPT does official RFI/RFP**

VHMS Key Products

Integrated Solutions

Materiel Solutions

- Ground Digital Logbook
- IETMs
- VHMS Comms Network (VCN)
- E-switch
- Wireless Network Card

EMS-NG(IETM)

Ground Digital LB

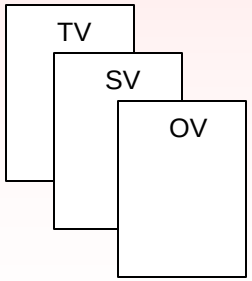
Wireless NIC

E-switch

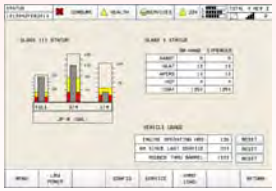
Systems Engineering Work Products

- GCS Specification
- Interface Requirements
- User Interface Descriptions
- DoDAF Architecture Artifacts

Specifications



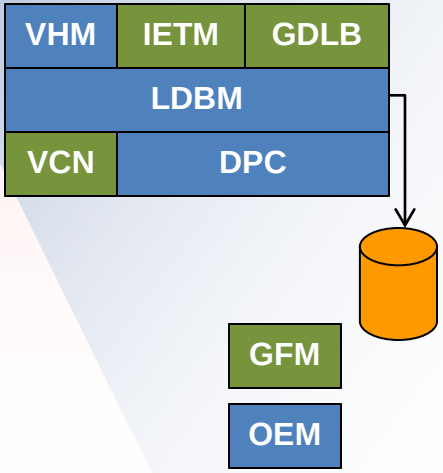
DoDAF Architecture Artifacts



Common Screens

Platform Software

- Vehicle Health Management
- Enhanced Diagnostics
- Logistics Database Management
- Integrating GFM



Baseline Benefits of Vehicle Health Management

- PM HBCT capabilities based initiative
  - Mission Readiness Assessment
  - Improved diagnostics and provides data storage & transfer capability
  - Provides a systems engineering approach to obsolescence

- Reduce Logistics Footprint and increase reliability
  - STE / BRADS / ATE Reduction/Elimination (cost avoidance)
  - Reduces Troubleshooting burdens (IETMS, GDLB)
  - Self diagnosing, self reporting and verification on board (real time)
  - Automates maintenance processes (PMCS)
  - Common User Interface (Screens)
  - Leverages existing platform diagnostics and vehicle networks

Improved diagnostics, reduced maintenance time, increased reliability, reduced NEOF's = improved OR rates and improved combat power for soldiers and reduced costs

Summary of Benefits Achievable with VHMS & CBM+

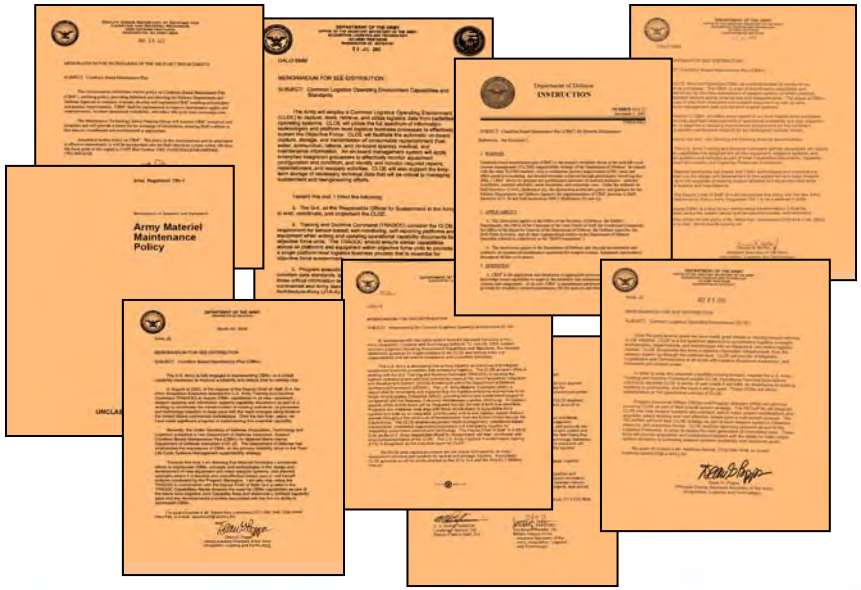
- Reduce or eliminate reliance on DSESTS in Field (cost avoidance)
- Reduce NEOF rates in Field & Sustainment (cost avoidance, inventory reduction)
- Platforms become self-diagnosing & self-reporting (workload reduction, accuracy increase)
- Automate maintenance (workload reduction & increase accuracy)
- Common maintenance display (reduced training assets, cross-functional field diagnosis)
- Increase Ao
- Reduce MDT (shorter diagnostic time, reduced maintenance workload, reduced part order errors)
- Automate PMCS (workload reduction & increase accuracy)
- Reduce time to process repair parts requisitions
- Increase asset visibility, situational understanding of combat power, consumables & crew situation
- Contribution to net-centric warfare & logistics capabilities
- Increase early warning of possible failures through CBM condition advisories (increase MTBSA, reduce potential collateral damage)

P3I

VHMS Program is being implemented with incremental capabilities on Current Legacy and future Modernization Programs (P3I)

Command Guidance for CBM

- DUSD(L&MR) memorandum, 25 Nov 2002
- ASA(ALT) memorandum, 25 Jul 2003
- MILDEP & G-4 memorandum, 05 May 2005
- ASA(ALT) memorandum, 17 August 2005
- AR 750-1, 20 Sep 2007
- DOD Instruction 4151.22, 2 Dec 2007
- ASA(ALT) memorandum, March 20 2008
- CLOE/CBM+ Policy Memorandum, 09 Feb 2009



Bottom line:

- PMs must implement CBM+ and integrate CLOE standards into both new and existing systems when deemed feasible and cost effective.
- Requires cost-benefit analysis for existing systems.

Next Capability Increment for Modernization Programs

Condition Based Maintenance (CBM)

- **A set of proactive maintenance processes and capabilities that improve operational availability and reduce the soldier's maintenance burden by performing maintenance based upon evidence of need in lieu of scheduled based or run-to-failure maintenance processes .**

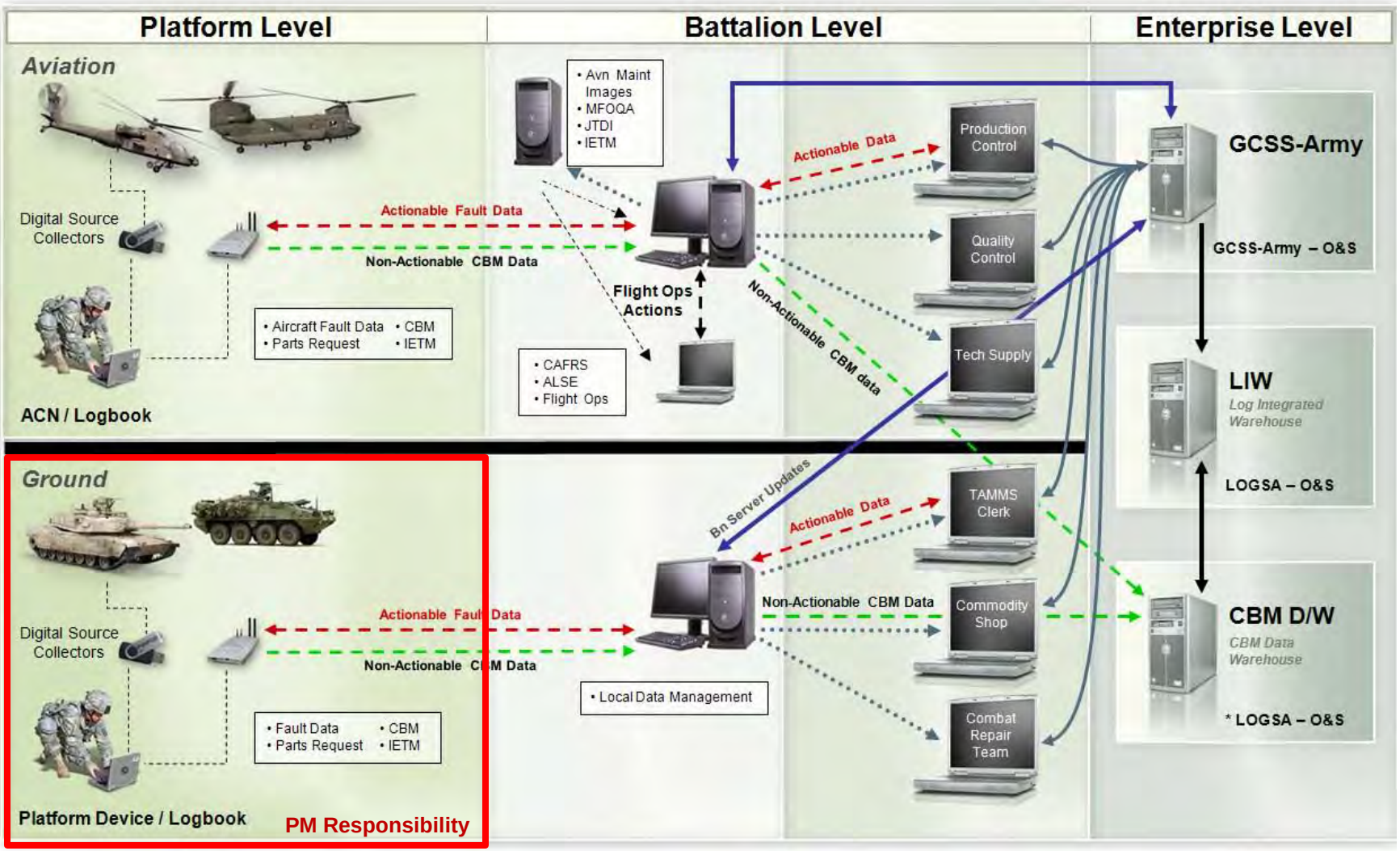
- **Accomplished through:**
  - **Digitized platform (embedded sensors and vehicle network)**
  - **Enhanced diagnostics**
  - **Evolving systems to predict remaining useful life of components**
  - **Then to automate supply transactions**

- **Derived from near real-time assessment and analysis of data from:**
  - **Embedded Sensors**
  - **Platform Maintenance Environments**
  - **Platform Supply & Maintenance Data (historical)**

Proactive. Evidence of Need. Condition Based Overhauls & Inspections

Ground Platform VHMS

Visualizing the Enterprise



Benefits of GCSS-Army/CLOE

Providing Soldiers a Single System to accomplish a wide range of Logistics Missions
HBCT is Leveraging "Big Army" Initiatives

PM HBCT VHMS Program Summary

- The VHMS program has developed and delivered system engineering documentation and a set of common materiel solutions.
- VHMS team is now developing platform specific materiel solutions to implement a VHMS system to connect to End to End Logistics Systems and Data Warehouses (logistics, engineering and CBM data).
- VHMS will connect to the Global Combat Support System Army (GCSS-A) – which is the Army's future Enterprise Resource Planning (ERP) system.

Question/Answer Session